REMARKS/ARGUMENTS

Claims 1-29 are pending in the application. The Applicant hereby requests further examination and reconsideration of the application in view of these remarks.

In paragraph 2, the Examiner rejected claims 1-6, 8-17, and 19-29 under 35 U.S.C. § 103(a) as being unpatentable over Mao. In paragraph 3, the Examiner objected to claims 7 and 18 as being dependent upon a rejected base claim, but indicated that those claims would be allowable if rewritten in independent form. For the following reasons, the Applicant submits that all claims are allowable over Mao.

Claims 1-14 and 27-29:

Claim 1 is directed to a MEMS device having a first flexible beam coupled at a first end to a substrate and at a second end to a movable plate positioned at an offset distance from the substrate. The first and second ends are separated by a prescribed distance at a rest position. The MEMS device has one or more motion drives adapted to change the distance between the first and second ends from the prescribed distance, thereby changing the offset distance.

Mao discloses a bistable electrostatic comb drive suitable for MEMS systems. A representative MEMS device having this comb drive is shown in Mao's Fig. 1A, which depicts a top view of the device. The device shown in Mao's Fig. 1A has a base (substrate) **12** and a movable element **14** attached to the base with latching spring arms **16**. At the place of the attachment of spring arms **16** to movable element **14**, the movable element has an opening **26**. Due to the presence of opening **26**, the walls of movable element **14** adjacent to the opening are relatively thin and flexible. The purpose of having these flexible walls is to ease the transition of spring arms **16** from a first latched state (shown in Fig. 1A) to a second latched state (not shown). More specifically, the second latched state can be reached by applying a voltage to a comb drive actuator **18**, which is configured to move movable element **14** along the long axis of that movable element (e.g., in the projection of Mao's Fig. 1A, toward the label "FIG. 1A"). Since the length of spring arm **16** is greater than the distance between the side of base **12** and the corresponding side of movable element **14**, the thin flexible wall adjacent to opening **26** is deformed when the spring arm passes the position in which a rigid beam portion **24** of the spring arm is substantially orthogonal to the sides of the base and movable element. Once spring arms **16** reach the second latched state (which is substantially a mirror image of the first latched state with respect to the plane orthogonal to movable element **14** and passing through the point of attachment of hinge **20** to the movable element), the thin flexible wall adjacent to opening **26** returns to the undeformed state similar to that corresponding to the first latched state shown in Fig. 1A.

It appears that, in the rejection of claim 1, the Examiner considered a flexible wall adjacent to opening **26** in Mao's Fig. 1A to be an equivalent of a first flexible beam recited in claim 1. For the following reasons, the Applicant respectfully disagrees with the Examiner's assessment. As evident from Mao's Fig. 1A, each of the flexible walls adjacent to opening **26** is a part of movable element **14** and, as such, has both ends coupled to that movable element. The Applicant submits that Mao does not teach or even suggest at least that one end of the flexible wall is coupled to base (substrate) **12**. In contrast, claim 1 explicitly recites that the first flexible beam is coupled at a first end to a substrate and at a second end to a movable plate.

Furthermore, a mirror (plate) **28** attached to movable element **14** is adapted to move together with the movable element parallel to base (substrate) **12**, which motion is parallel to the plane of Fig. 1A. The Applicant notes that this motion does not change the offset distance between mirror (plate) **28** and base (substrate) **12**, which is a distance between the mirror and the underlying portion of the base along the direction orthogonal to the plane of Fig. 1A. When the flexible walls adjacent to opening **26** are deformed by spring arms **16**, this deformation changes the distance between the ends of the flexible walls and causes a slight displacement of mirror (plate) **28** along the long axis of movable element **14** parallel to the plane of Fig. 1A. Since this displacement is parallel to base (substrate) **12**, it does not change the offset distance for mirror (plate) **28**. In fact, all motions generated by comb drive actuator **18** for mirror **28** occur parallel to the plane of Fig. 1A and, as such, without a change of the offset distance. In contrast, claim 1 explicitly recites that a change of the distance between the first and second ends of the first flexible beam changes the offset distance.

For all these reasons, the Applicant submits that the Examiner mischaracterized the teachings of Mao and used them improperly to reject claim 1. It is therefore submitted that claim 1 is allowable over Mao and the rejections of that claim should be withdrawn. For similar reasons, the Applicant submits that claims 27 and 29 are also allowable over Mao. Since claims 2-14 and 28 depend variously from claims 1 and 27, it is further submitted that those claims are also allowable over Mao.

Claims 15-20:

Claim 15 is directed to a MEMS device having: (i) a spring structure coupled between a substrate and a movable plate positioned at an offset distance from the substrate; and (ii) one or more motion drives having one or more movable portions supported on the substrate and mechanically coupled to the spring structure. The one or more movable portions are adapted to move substantially along a plane parallel to the substrate; and the spring structure is adapted to transfer motion of the one or more movable portions to the movable plate such that the offset distance is changed.

In the rejection of claim 15, the Examiner did not explain which structure in the MEMS device of Mao's Fig. 1A he considered to be an equivalent of the spring structure recited in claim 15. Presumably, the Examiner considered as such structure a combination of the flexible walls adjacent to opening **26** and spring arms **16**. However, as already explained above, when an actuating voltage is applied to comb drive actuator **18**, motion is transferred to movable mirror (plate) **28** such that the mirror moves parallel to base (substrate) **12**, i.e., without changing the offset distance for the mirror. In fact, Mao does not teach or suggest any spring structure that can transfer motion of comb drive actuator **18** to mirror (plate) **28** such that the offset distance for the mirror is changed. In contrast, claim 15 explicitly recites that "the spring structure is adapted to transfer motion of the one or more movable portions to the movable plate such that the offset distance is changed."

For all these reasons, the Applicant submits that claim 15 is allowable over Mao. Since claims 16-20 depend variously from claim 15, it is further submitted that those claims are also allowable over Mao.

Claims 14, 19, and 21-26:

Claim 21 is directed to a MEMS device having a motion drive supported on a substrate and having first and second movable portions. When a voltage differential is applied between the first and second portions, the first and second portions move with respect to the substrate and each other.

Mao discloses various comb drive actuators, which are depicted in Mao's Figs. 1A, 3A-C, 3E, 4A-B, 5A-D, and 7. For each of these actuators, Mao explicitly and repeatedly teaches that a voltage differential is always applied between a set of fixed fingers and a set of movable fingers (see, e.g., col. 5, lines 2-5; col. 7, lines 1-4, 14-16, and 31-34; and col. 8, lines 53-60). After the voltage differential is applied, only the movable fingers move with respect to the substrate, but the fixed fingers do not. The Applicant submits that nowhere in the specification does Mao teach or even suggest a motion drive that has two movable portions (sets of fingers), which portions can be electrically biased with respect to one another and, when so biased, move with respect to the substrate and each other. In contrast, claim 21 explicitly recites "a motion drive supported on a substrate and having first and second movable portions, wherein, when a voltage differential is applied between the first and second portions, the first and second portions move with respect to the substrate and each other."

For all these reasons, the Applicant submits that the Examiner mischaracterized the teachings of Mao and used them improperly to reject claim 21. It is therefore submitted that claim 21 is allowable over Mao and the rejections of that claim should be withdrawn. Since claims 22-26 depend variously from claim 21, it is further submitted that those claims are also allowable over Mao. The Applicant further submits that the same reasons that make claim 21 allowable over Mao also apply to claims 14 and 19. This fact provides additional reasons for the allowability of claims 14 and 19 over Mao.

In view of the above arguments and remarks, the Applicant believes that all pending claims are in condition for allowance. Therefore, the Applicant believes that the entire application is now in condition for allowance, and early and favorable action is respectfully solicited.

Respectfully submitted,

Date: 7/19/05

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